



UNIVERSITI PUTRA MALAYSIA

**INTRASPECIFIC RESOURCE PARTITIONING
BY *Hampala macrolepidota* (VAN HASSELT)
IN LOTIC AND LENTIC ENVIRONMENT
OF KENYIR RESERVOIR,
MALAYSIA**

AHMED JALAL KHAN CHOWDHURY

FPSS 1995 7

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**MASTER OF SCIENCE
UNIVERSITI PERTANIAN MALAYSIA**

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AHMED JALAL KHAN CHOWDHURY

**Thesis Submitted in Fulfilment of the Requirements
for the Degree of Master of Science in the
Faculty of Fisheries and Marine Science
Universiti Pertanian Malaysia**

December 1995



DEDICATION

This work is dedicated to
my parents, wife and son .

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my Chairman of the supervisory committee, Assoc. Prof. Dr. Hj. Mohd. Azmi Bin Ambak for his invaluable contribution, inputs and careful supervision of my Master programme in the Universiti Pertanian Malaysia. Without his constant encouragement this thesis would never have been written. I would like to extend my most sincere gratitude and deep appreciation to late Professor Dr. A. K. M. Mohsin for his profound sympathy and guidance during my study.

I am also indebted to the other members of my committee, Associate Professor Dr. Fatimah M. Yusoff and Dr. Sakri bin Ibrahim for their encouragement, meaningful comments and review of my work throughout the study period.

I would like to acknowledge Universiti Pertanian Malaysia for the Research Assistantship under IRPA project 50258-J3 which was kindly awarded to me during the tenure of my candidature as M.S. Student. It is indeed not an exaggeration to say that this study would never have been possible without this financial assistance. This kind of magnanimous support will hopefully harbinger in a new era in my life and continue to remain as a perennial source of inspiration. I wish to express my deep thanks to all the staff of FPSS in Terengganu for their hospitality and for their enthusiastic acceptance of me as part of the community. Acknowledgements are also due to the following friends, colleagues and well-wishers who were instrumental and have provided valuable inputs directly or indirectly in the presentation of this

dissertation: Dr. M.S. Khan, Mr. Zaidi Zakaria, Mr. M.A.Rouf, Mr. Tafazzal Hoque, Mr. A.Hadi, Mr. Yusaini, Mr. Akesah, Mr. Mannaf, Mr. Matnong, Mr. Sukiman, Mr. Sulaiman, Mr. Hosni, Mr. Mokhtar, Mr. Johari, Mr. K.Kasim, Mr. Shahbuddin, Mr. Shamsuddin, Mr. Sukree, Miss Rohaiza, Miss Eiza, Miss Rohana, Miss Rose, Mrs. Marhaini and Mrs. Farida Shamsuddin.

I also appreciate the assistance of Assoc. Prof. Dr. Hj. Mohd. Zaki Mohd. Said, Dean of the Faculty of Fisheries and Marine Science and the Dean of Graduate School, Universiti Pertanian Malaysia. I would also like to extend heartfelt thanks to Dr. Md. Lokman Husain, Head of the Department FPSS, Terengganu and Mr. Abdul Aziz bin Bahsir, Senior Assistant Registrar, Graduate School, UPM, who helped me in every possible way.

I wish to extend my gratitude to the Department of Fisheries and Ministry of Fisheries and Livestock, Bangladesh for their support and encouragement for my studying in Malaysia. I am sincerely grateful to Mr. Daud (David Harrison) , a teacher in English, Pusat Pengajian Matrikulasi, UPM, Terengganu for editing the manuscript.

Words are not enough to express my heartfelt feelings to my parents for providing me with their untiring guidance and support since my childhood. Last but not least, special note of thanks is due to my wife, Luna, whose inspirational role and enthusiasm helped boost my mental strength towards achieving the noble cause of education.

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Abstract of the thesis presented to the Senate of Universiti Pertanian Malaysia in fulfillment of the requirements for the Degree of Master of Science.

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RESERVOIR, MALAYSIA.**

by

AHMED JALAL KHAN CHOWDHURY

December 1995

Chairman : Assoc. Prof. Dr. Hj. Mohd. Azmi Bin Ambak

Faculty : Fisheries and Marine Science

A study of Intraspecific Resource Partitioning on a tropical sport fish 'Side bar barb' *Hampala macrolepidota* van Hasselt, was carried out in lotic and lentic habitat at Kenyir Reservoir, Terengganu, Malaysia.

Physico-chemical regimes of Kenyir Reservoir were also studied to determine the species ecological requirements. The water quality data showed that Kenyir Reservoir is suitable for fish culture. The most vital ecological factors, temperature and dissolved oxygen levels, were within the acceptable range for fish until 10.0 m depth. Waterlevel and rain fall both showed significant ($P < .05$) effects on the availability of fish in both habitats.

A significant difference ($P < 0.05$) of fish abundance have been observed in different depths of both habitat. Medium and large size fishes were ubiquitous in the study area. In the lotic habitat, medium and larger size fishes mostly used pool and riffle zones as their macrohabitat, whereas smaller size fishes preferred the rapid zone. In the lentic habitat, medium and large size fishes were found mostly around the submerged trees of the littoral area. Significantly, higher proportion ($P < 0.05$) of larger fish were available in the lotic than in the lentic habitat throughout the season. In lotic habitat cobble, boulder and bedrock were predominantly used as substrate by small, medium and large size fishes respectively, whereas sand and clay were predominantly used by medium and large size in lentic habitat. Openwater area had remarkably less density of fish and availability of all sizes in both littoral and open water showed significant difference ($P < 0.05$).

Habitat overlap values responsible for diet variation and food partitioning that evolved according to both temporal and ontogenic trends indicated that different size classes reduce spatial overlap by occupying different habitats and among depths within habitat. Segregation of sexes ($\alpha_{ws} < \alpha_w$) indicated that overlap within a habitat may be reduced by spatial separation of sexes.

Niche breadth ($B_i < 2$) indicated that all size of *Hampala macrolepidota* appeared to be extreme specialist feeders. Occurrence of food partitioning was not found extensively between size classes of *Hampala macrolepidota* in Kenyir Reservoir. Diet overlap α_w quantifying the sharing of food resources between the different size classes and high dietary overlap ($\alpha_w > 0.60$) between them indicates biological significance.

Individual size and diel period were the main factors responsible for diet variation and food partitioning that evolved according to cyclic (temporal) trends. Diel patterns of activity showed that *Hampala macrolepidota* was not a continuous feeder. It was observed that peak feeding time for small size was at noon (1000-1200 hours), for medium (2000-2200 hours) and for large size was at night (2200-2400 hours). Feeding activity changed with the different season. Feeding activity was comparatively high during dry season (nonmonsoon) and low during wet (monsoon) period. Thus, the feeding activity of different size fishes at different times would suggest that temporal differences could have a significant effect in partitioning food resources.

Nevertheless, habitat and temporal partitioning seemed as important as food partitioning in structuring the different sizes of *Hampala macrolepidota* in the lentic and lotic habitat of Kenyir Reservoir.

Abstrak tesis yang dikemukakan Kepada Senat Universiti Pertanian Malaysia sebagai memenuhi sebahagian dari keperluan untuk Ijazah Master Sains.

**PENGASINGAN SUMBER INTRASPEKIFIK
Hampala macrolepidota (VAN HASSELT) DI PERSEKITARAN
LOTIK DAN LENTIK DI TASIK KENYIR, MALAYSIA.**

Oleh

AHMED JALAL KHAN CHOWDHURY

Disember 1995

Pengerusi: Prof. Madya Dr. Hj. Mohd. Azmi Bin Ambak

Fakulti : Perikanan dan sains Samudera

Satu Kajian mengenai pengasingan sumber intraspekifik atau 'Intraspecific Resource Partitioning', oleh ikan Sebarau (*Hampala macrolepidota*) van Hasselt, telah dijalankan di Tasik Kenyir, Terengganu, Malaysia.

Sistem fiziko-kimia di Tasik Kenyir telah dikaji bagi menentukan pelbagai keperluan ekologi spesis ini. Data kajian mengenai kualiti air di Tasik Kenyir menunjukkan ia bersesuaian untuk ternakan ikan. Faktor ekologi yang utama, iaitu suhu dan tahap oksigen, terlarut pada julat yang sesuai bagi ikan ini di perairan empangan sehingga sedalam 10.0m. Kedua-dua aras ketinggian air dan (sukatan) hujan menampakkan kesan yang nyata ($P < .05$) ke atas kehadiran ikan di dalam kedua dua habitat.

Melalui pemerhatian yang dijalankan, terdapat perbezaan yang nyata ($P < .05$) di dalam kelimpahan ikan pada kedalaman air yang berbeza pada kedua-dua habitat. Ikan-ikan yang besar dan sederhana biasanya terdapat di kawasan yang sama. Di habitat lotik, kawasan-kawasan lubuk dan riak menjadi pilihan sebagai makrohabitat bagi ikan-ikan besar dan sederhana besar manakala ikan-ikan yang lebih kecil terdapat di zon air deras yang cetek. Di habitat lentik pula, ikan-ikan besar dan sederhana besar selalunya terdapat di keliling pokok-pokok yang telah tenggelam di kawasan littoral. Sebahagian besar ($P < .05$) daripada ikan yang lebih besar terdapat di habitat lotik berbanding dengan di habitat lentik bagi sepanjang tahun musim. Di habitat lotik yang berbatu, ikan-ikan menggunakan batu yang berlainan saiz sebagai substrat mengikut saiz mereka, umpamanya ikan besar menggunakan batu besar sementara ikan kecil terdapat pada batu kelikir yang kecil. Berlainan pula di habitat lentik di mana ikan sederhana besar menggunakan substrat berpasir dan berselut digunakan oleh ikan-ikan besar. Kepadatan ikan di kawasan perairan terbuka adalah ternyata lebih rendah. Terdapat perbezaan yang nyata ($P < .05$) di antara semua saiz ikan yang dijumpai di kawasan litoral dan perairan terbuka manakala kebanyakan ikan-ikan kecil terdapat di kawasan arus yang lebih laju berbanding dengan ikan yang lebih besar.

Nilai-nilai pertindihan habitat yang bertanggungjawab untuk perbezaan diet dan perkembangan pembahagian makanan mengikut aliran temporal dan antogenik, menunjukkan bahawa kelas yang berbeza mempunyai pertindihan tempat dengan mendiami habitat yang berlainan antara ketebalan habitat tersebut. Pengasingan berdasarkan jantina ($\alpha_w < \alpha_s$) telah menunjukkan bahawa perselisihan atau

pertindihan di dalam sesuatu habitat boleh dikurangkan melalui pengasingan mengikut jantina secara ruangan.

Kelebaran niche atau 'Niche breadth' ($B_i < 2$) telah menunjukkan bahawa semua jenis saiz spesis. *H. macrolepidota* mengamalkan cara pemakanan yang Khusus. Kesan pengasingan makanan (food partitioning) tidak meluas di antara kelas-kelas saiz *H. macrolepidota* yang berlainan di Tasik Kenyir. Didapati bahawa tindihan diet bagi kelas-kelas saiz *H. macrolepidota* yang berlainan adalah tinggi ($\alpha_w > 0.60$) dan ia menunjukkan kesan biologi yang penting.

Saiz dan jangka masa diel merupakan factor-factor utama yang menyebabkan variasi pemakanan dan pengasingan makanan, di mana kedua-duanya telah berkembang mengikut edaran masa. Aktiviti pemakanan mengikut peredaran harian telah menunjukkan bahawa waktu pemakanan *H. macrolepidota* adalah maksimum pada waktu malam bagi kelas ikan besar sementara kelas ikan kecil lebih menggemari waktu tengahari. Daripada pemerhatian yang dilakukan, waktu-waktu utama untuk pemakanan bagi ikan ini adalah antara jam 1000-1200 bagi kelas saiz kecil; jam 2000-2200 bagi kelas saiz sederhana dan antara jam 2200-2400 bagi kelas saiz besar. Di dalam setahun, aktiviti pemakanan ikan-ikan ini bertukar mengikut musim. Kadar pemakanan yang tinggi diperhatikan sewaktu musim panas berbanding dengan musim tengkujur. Perbezaan aktiviti pemakanan di antara kelas-kelas saiz yang berlainan pada waktu-waktu tertentu menunjukkan kemungkinan bahawa pengasingan sumber makanan mempunyai hubungan yang tingii dengan peredaran masa.

Walau bagaimana pun, jenis habitat dan pengasingan masa (temporal partitioning) juga sama penting bagi mengatur struktur *H. macrolepidota* mengikut perbezaan saiz di dalam kedua-dua habitat lentik mahupun lotik di Tasik Kenyir.

CHAPTER I

INTRODUCTION

Background of the Study

The brilliant colours, bizarre shapes and curious habits of tropical fishes are particularly well known and has drawn considerable interests from fishery scientists to aquaculturists, and throughout the tropics fresh water fishes are of immense importance in providing food for humans.

Fish is traditionally a major source of animal protein to the general population of the world. Malaysia is blessed with abundant water resources, both marine and fresh water, including natural lakes, rivers and man-made reservoirs providing great opportunities in culture and capture fisheries. With the growing impoundment of the waterbodies for the generation of hydroelectricity, flood mitigation and municipal water supply, the number of man-made lakes continues to increase in the country.

Lakes and reservoirs provide an important fishery resources for local people and ideal habitats for recreational fishery because of the availability of suitable sport fishes.